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C3I Associates

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C3I ASSOCIATES
110 NORTH WILLOW STREET
ONEIDA, NY13421

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APPROVED:

ALBERT G. FRANTZ
Project Engineer

FOR THE DIRECTOR:

JAMES W. CUSACK, Chief
Information Systems Division
Information Directorate

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John A. Beyerle, Gary Illingworth, and Kenneth Hawks

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
C3I Associates
110 North Willow Street
Oneida New York 13421

8. PERFORMING ORGANIZATION REPORT NUMBER
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Air Force Research Laboratory/IFSA
525 Brooks Road
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AFRL Project Engineer: Albert G. Frantz/IFSA/(315) 330-1456/Albert.Frantz@rl.af.mil

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Doctrinal Command and Control (C2) is referred to as 'military art.' The practice of this art is refined through the conduct of C2 military exercises and analysis of actual combat experiences. To assure that the Research and Development (R&D) programs of the Air Force Research Laboratory Information Systems Division (AFRL/IFS) meet the operational need of the war-fighter and are aligned with the developing C2 Concept of Operations CONOPS, the programs must be validated against realistic test scenarios by subject matter experts from the C2 domain.

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PREFACE AND ACKNOWLEDGMENTS

This is the final report summarizing the results of the effort expended by the C^3I Associates team in support of Contract F30602-01-C-0046. For additional information not addressed in this report, please contact John Beyerle, C^3I Associates, mailto:john.beyerle@rl.af.mil**.**

C3I Associates wishes to thank the members of the New York Air National Guard for their enthusiasm in the performance of their mission and assistance during this contract.

EXECUTIVE SUMMARY

C^3I Associates developed realistic scenarios under the Expert Science and Engineering Program. These scenarios were included in joint training exercises such as "Joint Patriot 2001" (JP2001), a national level exercise sponsored by the National Guard Bureau conducted during the summer of 2001, and the DARPA Network Centric Infrastructure for Command, Control and Intelligence (NICCI) Program. As part this contract, C^3I Associates, also took responsibility for the creation and dissemination of Air Tasking Orders (ATOs) for JP2001. C^3I Associates assisted in the secure communications preparations for JP2001 by developing a classified Secure Internet Protocol Router (SIPRNET) website for the posting of ATOs, as well as the collection and dissemination of various intelligence reports data inputs for the exercise. This SIPRNET site, created and maintained by Mr. Gary Illingworth, C^3I Associates, also included training modules for the input of classified data under the United States Message Text Format (USMTF) for various intelligence reports, including the Intelligence Report (INTREP), Mission Report (MISREP), and Request for Information (RI).

C^3I Associates also provided expertise for the Defense Cryptologic Program (DCP) at AFRL/RRS during the spring and summer of 2001. The work centered on building a classified marketing DVD video which emphasized aspects of the Electronics Intelligence (ELINT), Communications Intelligence (COMINT), Audio Processing, and Multiple Source Correlation (MSC) programs. Research was conducted, questions were prepared and audiotape interviews conducted with three of the four subjects. Then a script was prepared for the planned hour long video. A rough, initial demonstration was produced and shown to the client, using “Macromedia Director.” Classified videotape interviews were then conducted with two of the four principles, and transcripts prepared of their dialogues for revision.

C^3I Associates supported the Uninhabited Aerial Vehicle (UAV) Program, AFRL, Wright-Patterson AFB, OH, and AFRL Sensors Directorate, Rome Research Site, during 8-14 September 2001 at Ft. Drum, NY. This work was in conjunction with flight-testing experiments involving the “Dakota” UAV and associated software produced by Geneva Aerospace, Inc., of Addison TX (under a Small Business Innovative Research (SBIR) Phase Three program). This software module is being developed for the Joint Surveillance Target Attack Radar System (JSTARS) platform tested by Northrup-Gruman, Inc., of Melbourne, FL. C^3I Associates wrote press releases coordinated through the Public Relations Office at AFRL/RRS, and developed a Very Important Person (VIP) reception program for visiting representatives. C3I Associates is now in the process of producing a videotape presentation of the testing results for the Variable Autonomy Control System (VACS) Program Manager, AFRL Air Vehicles Directorate Integration and Demonstration Branch, Wright-Patterson Air Force Base (AFB), Dayton, OH.

In the fall of 2001 subsequent to the terrorist attacks against the United States, C^3I Associates personnel assisted in the creation of a Homeland Defense Testbed at the AFRL Rome Research Site (RRS).

C^3I Associates supported the Effects Based Operations program at AFRL, Rome Research Site during 10-13 November 2001. C^3I Associates developed a background paper on the taxonomy of Effects Based Operations (EBO). The paper was presented at the EBO 2001 Review in Baltimore, MD, and has engendered interest from the Joint Military Intelligence College (JMIC), Defense Intelligence Agency (DIA), Bolling AFB, in Washington, D.C.

C^3I Associates personnel also functioned as Subject Matter Experts (SMEs) in support of the Joint Defensive Planner (JDP), Joint Battlespace Infosphere (JBI), Master Caution Panel (MCP), Joint Targeting Toolkit (JTT), and the Interactive Data Wall (which is now deployed as part of "Operation Enduring Freedom") programs.

In support of the Joint Defensive Planner (JDP) program, C^3I Associates attended the Joint Theater Air and Missile Defense Planning (JTAMDP) Joint Data Engineering and Standardization (JDES) working group meeting 23-26 July 2001 in Hampton, VA. C3I Associates presented a Position/Location Data for Air and Missile Defense (AMD) Planning (Position) Information Requirements Worksheet (IRW). The Technical Interchange Meeting (TIM) reviewed the material contained in the IRW, and modifications were made. The members agreed upon the need to review the Position IRW. The second effort was to attend the JDP Users Group (JUG) meeting 6-9 August 2001, held at Northrup-Gruman PRB Division at Hollywood, MD. C3I Associates also presented a briefing on the status and near term testing activities on JDP, focusing on the TBMCS testing milestones that need to be supported for the fielding of TBMCS version 1.1. User support of the TBMCS testing dates is a problem due to numerous exercises and real world commitments.

1. INTRODUCTION

C^3I Associates was pleased to provide Subject matter Expertise for the Expert Science and Engineering Program at the Information Directorate (IFS), United States Air Force Research Laboratory at the Rome Research Site (AFRL/RRS). C^3I Associates' extensive background in military Command and Control (C^2) uniquely qualified the company to provide experienced Subject Matter Experts (SME) with current credentials within operational Theater level C^2. Our key investigator, Mr. John Beyerle, a command pilot, has over 25 years of experience in C^2, spanning the knowledge domain from C^2 concept development as an active duty USAF officer assigned within Air Combat Command (ACC), to system development on many AFRL C^2 development programs as a member of the research and development (R&D) community. C^3I Associates has been under contract to support the 152nd Air Operations Group (AOG), New York Air National Guard, (NYANG), providing the unit with operational expertise and guidance in their transition to an Air Operations Group from their former mission as a mobile radar Air Control Group. C^3I Associates has been responsible for generating the Air Tasking Orders (ATOs) for the last three annual "Global Patriot" joint military exercises, the largest exercises of their kind in the world. To assure research and development (R&D) programs meet the actual needs of the warfighter, C3I Associates developed operationally realistic scenario segments for many current developments at AFRL, and supported the development of various test databases.

Research and Development (R&D) at the United States Air Force Research Laboratory, Rome Research Site (AFRL/RRS), is currently organized under three main thrusts: Global Grid, Global Information Exchange, and Dynamic Planning and Execution. Each of these three main thrusts is composed of multiple sub-thrusts of research and development, and although the descending sub-thrusts become increasingly specific, all overlap. This effort supported programs in all of these areas. C3I Associates supported the following R&D programs: Joint Battlespace Info Sphere (JBI), Joint Defensive Planner (JDP), Defense Cryptologic Program (DCP), Variable Autonomy Control System (VACS), Homeland Defense Test Bed (HDTB), Effects Based Operations (EBO), Master Caution Panel (MCP), Intelligent Information Packaging (IIP), DARPA Network-centric Infrastructure for Command Control and intelligence, and Link Analysis for the Air Campaign Plan (SBIR). C3I associates provided over 2000 hours of engineering expertise to these programs in the technical areas further described in the technical approach section of this report, which follows.

2. TECHNICAL APPROACH

2.1. Technical Discussion

2.1.1. Scenario Development

To assure that the Research and Development (R&D) programs of AFRL/IFS meet the operational needs of the war-fighter, and are aligned with the developing Command and Control (C^2) Concept of Operations (CONOPS), the programs must be validated against realistic test scenarios.

2.1.1.1. Results and Discussion

C^3I Associates developed realistic scenarios for C^2 system development programs, Joint Battlespace Infosphere (JBI), Effects Based Operations (EBO), NICCI, IIP and BOEING CRADA under JBI. These scenarios address future dynamic tasking C^2 methodologies as well as current C^2 Concept of Operations (CONOPS).

To be meaningful, the data elements associated with scenarios must be defined and loaded into the host computer system. The experience of key personnel within C^3I Associates with respect to the collection, analysis, and fusion of these data elements into both unclassified and classified distributed data systems and networks greatly simplified this task.

2.1.2. C^2 Subject Matter Expertise

Doctrinal Command and Control (C^2) is referred to as a 'military art.' The practice of this art is refined through the conduct of C^2 military exercises and analysis of actual combat experiences. The experience gained from both these types of activities is collected and published in a body of knowledge referred to as Joint Unit Lessons Learned (JULLS).

2.1.2.1. Results and Discussion

C^3I Associates provided Subject Matter Experts (SME) in support of the Air Operations Center (AOC) during joint exercise "Global Patriot" for the last three years. "Global Patriot," sponsored by the National Guard Bureau, is the largest exercise of its kind in the world, and involves not only joint active duty and reserve forces form all branches of United States military, but also coalition forces from the United Kingdom, Germany, as well as observers from military branches in South America. C^3I Associates interacted with these forces by operating the Combat Plans division of the AOC. C^3I Associates developed the entire Air Tasking Order (ATO) for the "Global Patriot" exercises, and during this year's exercise ("JP2001") tasked over 200 aviation assets for its six-day live flying portion. C^3I Associates also participated as a SME during JEFX in the Time Critical Target (TCT) cell of Combat Operations.

2.1.3. R&D Program Development Support

To be relevant in assuring effective reviews of R&D programs by end users, supporting documentation must be understandable by the Operating Commands. System User Interfaces must be clear and supportive of the C^2 CONOPS and contain meaningful flags and display icons. These requirements must be addressed as part of the development from its inception.

2.1.3.1. Results and Discussion

C^3I Associates provided reviews and development of CONOPS in support of the AFRL/RRS Information Directorate's Joint Battlespace Infosphere (JBI) program. Mr. Beyerle's involvement continues to provide inputs to this program based on his clear understanding of the goals of this program and the needs of the warfighter. In support of the Joint Defensive Planner (JDP) program, C^3I Associates provided software documentation review; and inputs to and comments on the Concept of Employment (CONEMP) for deployment in the Theater Battle Management Core System (TBMCS).

2.2. Technical Program: Conclusion

C^3I Associate's involvement in current and future C^2 CONOPS, together with its clear understanding of C^2 technologies, placed the company in a unique position to provide this level of support. C3I Associates key investigator, Mr. John Beyerle, is a leading Combat Operations SME in C^2 within the DoD, and supported the Joint Battlespace Infosphere (JBI) and Effects Based Operations program. For Defensive Operations, Mr. Kenneth Hawks, was the key investigator and provided SME support to the Joint Defensive Planner (JDP) program office. C3I Associates also supported the Ballistic Missile Defense Office (BMDO) in systems engineering, data standardization, United States Message Text Format (USMTF) implementation, and operational suitability of functional system components. Mr. Gary Illingworth functioned as C3I Associate's aerospace and ground intelligence expert, researcher, writer, and multimedia producer. Through his efforts C3I Associates produced the 25-minute video "Joint Patriot 2001" for the National Guard Bureau in Washington, and developed unclassified informational websites describing coalition participation in the exercise. On behalf of the Defense Cryptologic Program (DCP), C3I Associates developed an instructional Secret Internet Protocol Router (SIPRNET) classified website for the input of classified exercise intelligence inputs. This work required development of a series of interactive web pages including instructions for users on how to fill out USMTF reports, including pages for the Intelligence Report (INTREP), Request for Information (RI), and Mission Report (MISREP). In addition, the Air Tasking Orders (ATOs) generated by C3I Associates using the TBMCS were promptly posted on this website and thus were available for all players in the national exercise.

3. CONCLUSIONS AND RECOMMENDATIONS.

- In order to increase the speed and accuracy of the information used in the decision process of theater C^2, new methodologies need to be developed that do not 'push' the data, but rather provide a C^2 architecture that provides all necessary knowledge on a real-time 'as needed' basis, using an information centric methodology of 'publish and subscribe'.

- As the theater C^2 moves forward from this data 'push' technology to an information centric methodology of 'publish and subscribe,' current efforts on behalf of the Information Directorate in this respect become more relevant.

- Modern warfare has reduced the decision cycle from days to hours, and in the operational focus of the future, when tasking is fully dynamic, the C^2 decision cycle will need to operate successfully within minutes.

- Since the terrorist attacks against the United States in September 2001, the pace of technology and operational requirements dictate more urgently that programs must be ready for fielding even as the technologies are being investigated. To accomplish this; operational concepts must be a part of the initial experimental design.

- The Airborne Command and Control, Intelligence, Surveillance, and Reconnaissance (AC^2ISR) desire to deliver annual increments to the Theater Air Control System (TACS) as part of the Combined Air Operations Center Experiment (CAOC-X) requires that AFRL increments meet operational needs and are viable within the CAOC Concept of Operations (CONOPS) prior to installation at Langley AFB, VA.

- The key to successful incremental insertion lies in assuring the suitability of the increment from an operational perspective while still at AFRL/RRS.

- Although commercial technologies avail themselves rapidly and may promise increased computational capabilities, their choice of selection for instantiation in the C^2 architecture should be tempered with operational considerations.

4. LIST OF SYMBOLS, ABBREVIATIONS, AND ACRONYMS

AC^2ISR	Air Command and Control, Intelligence, Surveillance, and Reconnaissance.
ACC	Air Combat Command.
ACG	Air Control Group.
AFRL	Air Force Research Laboratory.
AMC	Air Mobility Command.
AOG	Air Operations Group.
ATO	Air Tasking Order.
BMDO	Ballistic Missile Defense Office.
C^2	Command and Control.
C^3I	Command, Control Communications, and Intelligence.
CAOC	Combined Air Operations Center.
COA	Course of Action.
CONEMP	Concept of Employment
CONOPS	Concept of Operations.
CTAPS	Contingency Theater Air Planning System.
DCP	Defense Cryptologic Program.
DoD	Department of Defense.
DPE	Dynamic Planning and Execution.
EBO	Effects Based operations.
EBO-WS	Effects-Based Operations Wargaming Simulation.
FW	Fighter Wing.
GIE	Global Information Exchange.
IF	Information Directorate.
ISR	Intelligence, Surveillance & Reconnaissance.
IWPC	Information Warfare Planning Capability.
JAOC	Joint Air Operations Center.
JAOP	Joint Air Operations Plan.
JBI	Joint Battlespace Infosphere.
JDP	Joint Defensive Planner.
JFACC	Joint Forces Air Component Commander.
JOP	Joint Offensive Planner.
JDES	Joint Data Engineering and Standardization.
JSTARS	Joint Surveillance Target Attack Radar System.
JTAMDP	Joint Theater Air/Missile Defense Planning.
JTT	Joint Targeting Toolkit.
JULLS	Joint Unit Lessons Learned System.
LAN	Local Area Network.
MCP	Master Caution Panel.
MOE	Measure of Effect.
NATO	North Atlantic Treaty Organization.
NGB	National Guard Bureau.
NICCI	Network Centric Infrastructure for Command, Control & Intelligence

NYANG	New York Air National Guard.
OV	Operational View
R&D	Research and Development.
RRS	Rome Research Site (part of AFRL).
SME	Subject Matter Expert.
TACS	Theater Air Control System.
TBMCS	Theater Battle Management Core Systems.
TCT	Time Critical Targeting.
TTP	Tactics, Techniques and Procedures.
UAV	Uninhabited Aerial Vehicle.
XML	eXtensible Markup Language.